

A Novel Antimicrobial Ice Based Cleaning-in-Place Meat Grinder Sanitization Process Development

Beef is one of the most popular meats in the United States. The retail equivalent value of US beef industry was \$88 billion in 2013. It is estimated that 60% of all retail beef sales are in the form of ground beef. Beef products, especially ground beef is notoriously associated with foodborne outbreaks. The muscles of healthy animal are free of pathogens, but during the slaughter and especially during hide removal process, pathogens may get transferred to the surface. Ground beef is usually prepared from beef trimmings which are generally cut from the surfaces of whole muscle cuts during fabrication. These surfaces are blend and ground to produce ground beef. The USDA-FSIS (2010) reported that more than two million pounds of beef product were recalled in 2009 due to suspected presence of foodborne pathogens. Since the beginning of this year already three ground beef recalled have been reported due to the presence of foodborne pathogens. The majority of ground beef recalls involved pathogen, *E. coli* O157: H7.

Some of these contamination events may be the result of cross-contamination from knives, and other processing plant food contact surfaces or operation like grinding. There are existing protocols and control points in the meat processing, or retail operations specify the frequency and methods to take grinder apart for cleaning and sanitization. However, if contamination occurred between the cleaning operations, the grinder will potentially cross-contaminate other food products after. The increase in the frequency of disassembling the grinder for cleaning will lead to increasing in operation cost and reduced productivity. Hence, there is a need to develop an intervention step to control cross-contamination during grinding.

Peroxyacetic acid (PAA) is known for its antimicrobial efficacy. PAA has been proven effective in reducing the variety of foodborne pathogens from various food matrices and food contact surfaces. Several studies also reported the use of PAA ice can significantly improve the overall microbiological quality of seafood.

I am proposing to develop a novel sanitation process for meat grinders using PAA ice. In this project meat grinders will be sanitized by processing PAA ice which will not only clean the internal meat contact surfaces but also sanitize it within 3-5 min. For this study, table top meat grinders will be contaminated with *E. coli* O157: H7 by processing tainted beef trim. PAA ice prepared by freezing the PAA solution will be process through contaminated table top meat grinders. Following the ice treatment, uncontaminated beef will be processed through the treated grinder and corresponding ground beef will be aseptically collected and analyzed for the presence of *E. coli* O157: H7 by plating the appropriately diluted ground beef samples on sorbitol MacConkey agar to determine the efficacy of the antimicrobial treatment. A similar experiments will be performed using deionized water ice as a control. All experiments will be repeated three times and data will be analyzed. Research findings of this project will be presented at the Beef Industry Safety Summit (2016). We estimate that literature review, beef and microbial media purchase will require 15 days, while experimental portion of the project will be completed in 3 ½ months and data analysis and poster preparation would take approximately 20 additional days to complete. This research could significantly improve the overall safety of ground beef. Moreover, the cattle industry is the largest segment of Oklahoma agriculture and accounts for 46% of all cash receipts. The findings of this research could potentially make beef processing industry more profitable by reducing the number of ground beef related food safety recalls, thereby strengthening the overall economy of the state.